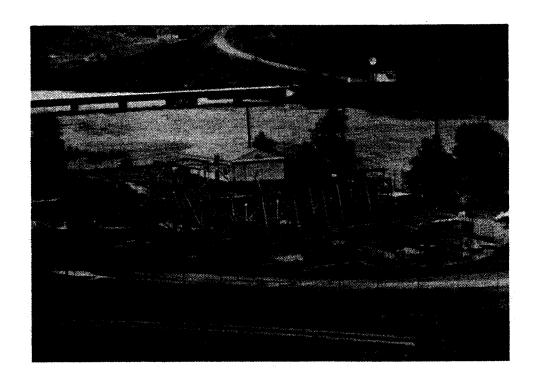


Idaho Power

OXBOW HATCHERY

1987 Steelhead Brood Year 1987 Spring Chinook Salmon Trapping



by

Douglas R. Burton Hatchery Superintendent I

October 1988

TABLE OF CONTENTS

| | Page | <u> </u> |
|---|------|-------------------|
| ABSTRACT | | 1 |
| INTRODUCTION | | 2 |
| LOCATION | | 2 |
| OBJECTIVES | | 2 |
| FISH TRAPPING AND REARING FACILITIES | | 2 |
| WATER SUPPLY | | 3 |
| STAFFING | | 3 |
| FISH PRODUCTION | | 3 |
| Steelhead Trapping Steelhead Spawning Steelhead Outp lant s Fish Health Spring Chinook Salmon Trapping Spring Chinook Transport Spring Chinook Health and Mortality | | 5 9 9 11 |
| EXPERIMENTAL PROJECTS | | 13 |
| Induced Maturation of Steelhead | | 14 |
| HATCHERY IMPROVEMENTS | | 16 |
| RECOMMENDATIONS FOR FUTURE IMPROVEMENTS | | 16 |
| MISCELLANEOUS ACTIVITIES | | 19 |
| ACKNOWLEDGEMENTS | | 19 |
| LITERATURE CITED | | 19 |
| ADDENDIGES | | 20 |

LIST OF TABLES

| | <u>P</u> | <u>age</u> |
|------------|---|------------|
| Table 1. | Summary of steelhead spawning operations at Oxbow Hatchery, 1987 | 8 |
| Table 2. | Summary of outplants of adult steelhead from the Oxbow Hatchery, October 1986 through May 1987 | . 10 |
| Table 3. | Results of tests using increasing concentrations of Argentyne in water-hardening solutions for steelhead trout eggs at Oxbow Hatchery, spring, 1987 | . 15 |
| | LIST OF FIGURES | |
| Figure 1. | Water temperature profile, Oxbow Hatchery, 1986 | 4 |
| Figure 2. | Length frequency distribution of adult female steelhead, Oxbow, 1986-1987 | 6 |
| Figure 3. | Length frequency distribution of adult male steelhead, Oxbow, 1986-1987 | 7 |
| Figure 4. | Length frequency distribution of spring chinook salmon, Oxbow, 1987 | . 12 |
| Figure 5. | Average total length of smallmouth bass reared at Oxbow Hatchery, July-November, 1987 | . 17 |
| Figure 6. | Average body weight of smallmouth bass reared at Oxbow Hatchery, July-November, 1987 | . 17 |
| Figure 7. | Survival rate of smallmouth bass fry reared at Oxbow Hatchery, July-November, 1987 | . 18 |
| | LIST OF APPENDICES | |
| Appendix : | 1. Location of Oxbow Hatchery and the Hells Canyon Dam complex | . 21 |
| Appendix 2 | 2. Relative location of the Hells Canyon fish trap to the Hells Canyon Dam complex | . 22 |
| Appendix 3 | 3. Schematic diagram of the Hells Canyon fish trap | 23 |

LIST OF APPENDICES (Continued)

| | <u>Pa</u> | age |
|-------------|--|------|
| Appendix 4. | Schematic diagram of Oxbow Hatchery | . 24 |
| Appendix 5. | Historical record of steelhead trapping and spawning at Oxbow Hatchery | . 25 |
| Appendix 6. | Historical record of spring chinook salmon trapped in the Hells Canyon fish trap | . 26 |
| Appendix 7. | Length frequency of female steelhead, Oxbow, 1986-1987 | . 27 |
| Appendix 8. | Length frequency of male steelhead, Oxbow, 1986-1987 | . 28 |
| Appendix 9. | Length frequency of adult chinook, Oxbow, 1987 | . 29 |

ABSTRACT

A total of 3,209 adult steelhead were trapped at Hells Canyon Dam for the 1987 brood year (2,455 in fall 1986, and 754 in spring 1987). Eight hundred fifty-six were planted out in the Boise River, and 857 were stocked in Hells Canyon Reservoir. Another 39 were captured incidental to chinook salmon trapping and released into Hells Canyon Reservoir. Six hundred eighteen females were spawned, yielding 2,851,100 green eggs. Survival to eye-up was 72.3%, resulting in 2,074,900 eyed eggs, of which 1,277,000 were shipped to Niagara Springs Hatchery. The remaining 797,900 were kept to hatch at Oxbow. Ninety-two percent (92X) survived to hatch, but disease and other problems eliminated all fry, therefore, none were planted out.

Spring chinook trapping captured 543 adults and 4 jacks. Five hundred thirty-six (532 adults and 4 jacks) were transferred to Rapid River Hatchery, where they were held until spawning.

Author:

Douglas R. Burton Hatchery Superintendent I

INTRODUCTION

Oxbow Hatchery is a steelhead trout (Salmo gairdneri) and spring chinook salmon (Oncorhynchus tshawytcha) facility owned and funded by Idaho Power Company (IPC) and operated by the Idaho Department of Fish and Game (IDFG). The primary purpose of Oxbow Hatchery is to trap sufficient numbers of returning adult steelhead and spring chinook to fulfill the Hells Canyon portion of IPC's anadromous fish mitigation requirements for the upper Snake River.

LOCATION

Oxbow Hatchery is located on the Oregon shore of the Snake River, at river mile 270 (602 river miles from the Pacific Ocean) (Appendix 1). Adult fish are trapped at IPC's Hells Canyon Dam facility, approximately 23 miles downstream from the hatchery (Appendix 2).

OBJECTIVES

The objectives of Oxbow Hatchery are to:

- 1. Trap adult steelhead trout and spring chinook salmon returning to the Snake River at Hells Canyon Dam.
- 2. Spawn steelhead and incubate the eggs to the eyed stage for transfer to other hatcheries.
- 3. Rear available excess steelhead eggs to the fry stage for release.
- 4. Temporarily hold and transfer adult spring chinook salmon to Rapid River Hatchery.

FISH TRAPPING AND REARING FACILITIES

The Hells Canyon fish trap consists of a fish ladder and false weir, a sorting grate to remove small fish, and a holding pool with a submerged loading hopper (Appendix 3). A mechanical crowder forces fish from the holding pool into the hopper, which is then lifted approximately 65 ft. (20 m) up to a waiting fish truck. The lift is made using a 10-ton crane mounted on the upper level of the facility.

The Oxbow Hatchery facility includes four concrete holding ponds equipped with power-assisted crowders, fish loading equipment, and sorting tanks (Appendix 4). Two ponds are 34 ft. x 104 ft. x 8 ft., and two are 34 ft. x 54 ft. x 8 ft. Normal operating water depth in these ponds is 4 ft. There are six 3 ft. x 6 ft. x 100 ft. production raceways with cinder block walls. A 360 ft. gravel spawning channel has not been used for many years. The new domestic well was drilled only 30 ft. from the old channel and could be contaminated if the channel is filled with river water.

The incubator room currently holds 14 double-stack Heath incubators, each containing 18 egg trays. One or two top trays are generally used for silt settling, depending on the need for incubator space and the silt load in the river water. There are eight assorted fiberglass vats for swim-up fry, with a collective volume of $183.4~{\rm ft}^3$. A total of $190,000~{\rm fry}$ can safely be held to a size of $2,500~{\rm fish/lb}$. in the fry vats.

WATER SUPPLY

Water is supplied to the hatchery directly from the Snake River by four electric pumps. Two 100-hp pumps supply a maximum of 16 cfs each to the holding ponds and raceways, while two 5-hp pumps supply the incubator system. Only one pump from each pair is used during normal operation. The other two pumps provide a backup water system and are supplied with electricity from an alternate power source.

A water temperature profile at Oxbow Hatchery from September 1986 through July 1987 is presented in Figure 1.

STAFFING

The hatchery staff consists of a Hatchery Superintendent I and one four-month Bio-Aide. Housing for the permanent employee consists of a 1976 model, three-bedroom trailer house. Two bedrooms are available in the hatchery building to accommodate overnight visitors.

FISH PRODUCTION

Steelhead Trapping

The Hells Canyon fish trap was put in operation on September 29, 1986 and operated intermittently until December 5 for a total of 441.67 hours. A total of 2,455 adult steelhead were captured. Three fall chinook jacks were also trapped and released into Hells Canyon Reservoir. One thousand three hundred four steelhead (1,304) were ponded at the hatchery for spring spawning, 985 were outplanted for sport fisheries, and 166 were lost as trapping or hauling mortalities.

Figure 1. Water temperature profile, Oxbow Hatchery, 1986.

The trap was put back in operation on March 2, 1987 and operated intermittently until March 31. The trap ran for 369.5 hours and captured 754 adult steelhead. Seven hundred steelhead were ponded, 53 outplanted in Hells Canyon Reservoir, and 1 mortality was lost in the trap.

The combined steelhead trapping total for fall and spring seasons was 3,209 adults.

A total of 1,870 steelhead were length measured, and the length frequency distributions for each sex are shown in Figures 2 and 3. The overall sex ratio observed for both fall and spring fishes was 908 males:1,047 females (46.4% and 53.5%, respectively).

Eighteen IDFG floy tags, nine Oregon Department of Fish and Wildlife floy tags, and eight National Marine Fisheries Service jaw tags were recovered from trapped steelhead. Additionally, one IDFG floy tag was returned by an angler. Three fish with floy tag anchors but no identification sleeves were also observed. All tags were returned to the respective agencies with pertinent trapping information. Four fish were missing left pelvic fins, indicating possible presence of coded wire tags. Snouts were removed from these fish at spawning and sent to the tag recovery laboratory in Lewiston.

Forty-seven fish (2.0% of 2,408 observed) appeared to be of natural or "wild" origin, 20 (0.8%) were hatchery fish without adipose fin clips, and the remaining 2,341 (97.2%) were hatchery-origin fish with adipose fin clips. Hatchery or natural determination was based on presence and/or condition of fin rays in the dorsal and lateral fins.

Forty-two fish (1.7%) showed subcutaneous emboli from nitrogen gas supersaturation. Thirty-five of these were trapped during October, when water was being spilled over Hells Canyon Dam. Only one was observed during spring trapping. Ninety-six (4.0%) had gill net scars, and 173 (7.2%) had other wounds or scars of undetermined origin.

Incidental fish species captured during both fall and spring trapping included 3 fall chinook salmon jacks, 33 rainbow trout/residualized steelhead smolts, 2 whitefish, and an undetermined number of bridgelip and largescale suckers.

An additional 39 adult steelhead were captured during chinook salmon trapping season. All were released into Hells Canyon Reservoir.

Steelhead Spawning

Fourteen steelhead egg lots were taken between March 23 and May 6, 1987 (Table 1). A total of 2,851,100 green eggs were taken from 618 females, for an average of 4,613 eggs per female. Survival to eye-up was 72.31, or 2,074,900 eyed eggs. A total of 1.277,000 eyed eggs were sent to Niagara Springs Hatchery in 5 shipments. The remaining 797,900 were kept to hatch at Oxbow.

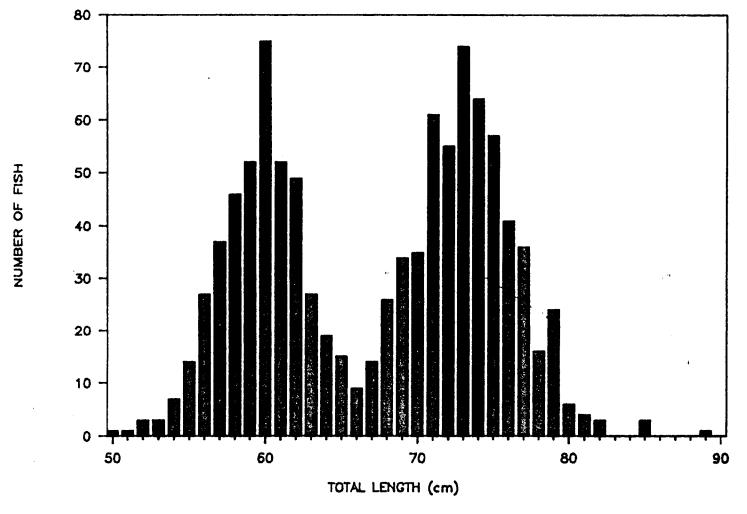


Figure 2. Length frequency distribution of adult female steelhead, Oxbow, 1986-1987.

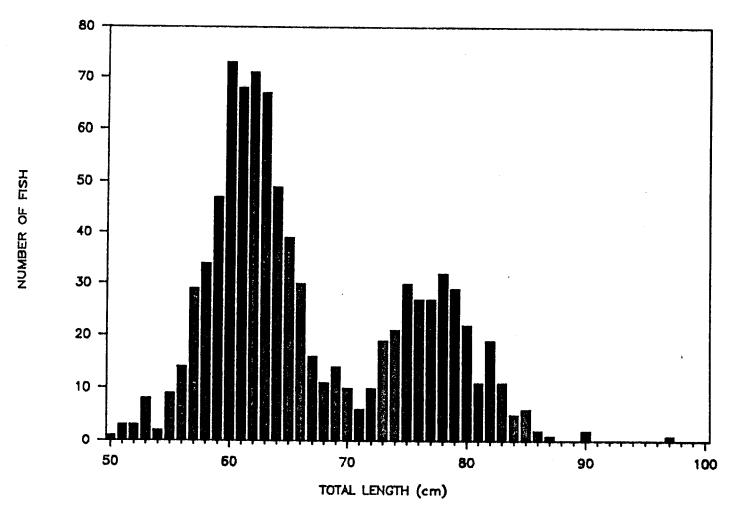


Figure 3. Length frequency distribution of adult male steelhead, Oxbow, 1986-1987.

Table 1. Summary of steelhead spawning operations at Oxbow Hatchery, 1987.

| | | | | Average | _ | |
|-----|----------|---------|-----------|------------|-------------|---------|
| | | | Total | Number | Number | |
| | Spawning | Females | eggs | eggs per | eggs | Percent |
| Lot | date | spawned | in take | female | eyed-up | eye-up |
| | | | | | | |
| 1 | 3/23 | 26 | 122,369 | 4,706 | 94,490 | 77.2 |
| 2 | 3/24 | 11 | 51,42 | 4,640 | 37,017 | 72.5 |
| 3 | 3/30 | 44 | 215,030 | 4,887 | 166,380 | 77.4 |
| 4 | 3/31 | 95 | 507,313 | 5,340 | 396,235 | 78.1 |
| 5 | 4/6 | 88 | 408,170 | 4,638 | 319,013* | 78.2 |
| 6 | 4/7 | 89 | 410,290 | 4,610 | 298,728* | 72.8 |
| 7 | 4/9 | 98 | 431,055 | 4,399 | 301,785* | 70.0 |
| 8 | 4/14 | 103 | 437,029 | 4,243 | 295,313* | 67.6 |
| 9 | 4/17 | 36 | 147,414 | 4,095 | 108,546* | 73.6 |
| 10 | 4/21 | 12 | 52,742 | 4,395 | 38,870 | 73.7 |
| 11 | 4/24 | 3 | 13,310 | 4,437 | 6,455 | 48.5 |
| 12 | 4/28 | 6 | 25,255 | 4,209 | 3,556 | 22.0 |
| 13 | 4/30 | 4 | 16,873 | 4,218 | 3,705 | 22.0 |
| 14 | 5/6 | 3 | 13,248 | 4,416 | 2,807 | 21.2 |
| | TOTALS: | 618 | 2,851,086 | | 2,074,900 | |
| | | | CUMULA | TIVE PERCE | NT EYE-UP = | 72.3 |

^{*}Lots shipped in part or in entirety to Niagara Springs Hatchery.

Steelhead Outplants

A total of 1,752 adult steelhead were stocked in the Boise and Snake rivers to provide a sport fishery in areas above Hells Canyon Dam (Table 2). Nine hundred eighty-five fish were planted out in the fall and 664 were stocked in March, after it became evident that spring trapping would provide replacements to the hatchery. Fifty-three spring-trapped fish were released immediately, and 64 males were released after being used once for spawning. Another 39 adult steelhead were captured during salmon trapping and were released into Hells Canyon Reservoir.

Fish Health

The recirculating pump on the IPC fish truck failed on October 3, 1986 and 124 adult steelhead were lost in transit from Hells Canyon Dam to the Oxbow Hatchery. Another 20 hauling mortalities before that date may have resulted from the same problem. An entire new aeration and oxygen injection system was installed over the winter.

Ponded steelhead adults were given no chemical treatments to control fungus or other diseases. Fifty-one pond mortalities were recorded among the fish held over the winter $(3.9\mathrm{X})$. This number would have certainly been higher, but some of the worst fungused individuals were selected out for an early whirling disease sample. A final prespawning mortality of ponded females, including sampled fish, was $108~(14.0\mathrm{X})$.

Myxosoma cerebralis, the causative agent of whirling disease, has been found in adult steelhead taken from some Oregon tributaries of the Snake River (Rich Holt, Department of Microbiology, Oregon State University, personal communication). A group of 60 fish were sacrificed on March 3 and their heads and gill arches sent to Oregon State University for analysis. Another set of samples were collected from fish killed during spawning. Results were negative from both sets of samples.

Pat Chapman, IDFG Fish Pathologist, took various disease samples from spawning adults on April 9. Bacterial tests for Renibacterium salmoninarum, Yersinia ruckeri, Aeromonas salmonicida were all negative. Viral assays for IHN virus were negative, but assays for IPN virus were positive in 2 of 12 tissue pools and were confirmed by serum neutralization. Twelve ovarian fluid pools were negative for both IHN and IPN.

Approximately 435,000 steelhead sac fry were lost when local power went off on May 11 and the incubator line pump was not reactivated. Incubator stacks were without fresh water for about 40 minutes and as a result, an increase in mortality among the salvaged fry began •6 days later and progressed until approximately 74,500 fry had been lost by May 28.

Table 2. Summary of outplants of adult steelhead from the Oxbow Hatchery, October 1986 through May 1987.

| | Number | | |
|---------|---------|-------------------|-------------------------------|
| Date | of fish | Destination | Planting site |
| | | | |
| 10/7/86 | 60 | Hells Canyon Res. | Big Bar Campground |
| 10/9 | 106 | Boise River | Glenwood Bridge to Barber Dam |
| 10/17 | 108 | Boise River | Glenwood Bridge to Barber Dam |
| 10/23 | 192 | Boise River | Eagle Bridge to Barber Dam |
| 10/23 | 95 | Hells Canyon Res. | Across from Oxbow powerhouse |
| 11/4 | 110 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 11/6 | 91 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 11/7 | 50 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 11/20 | 100 | Boise River | Glenwood & State St. bridges |
| 11/23 | 24 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 11/25 | 17 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 11/29 | 11. | Hells Canyon Res. | Oxbow Hatchery outlet |
| 12/7 | 21 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 3/20/87 | 200 | Boise River | Glenwood Bridge to Barber Dam |
| 3/24 | 190 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 3/26 | 150 | Boise River | Glenwood Bridge to Barber Dam |
| 3/26 | 69 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 3/31 | 55 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 4/12 | 64 | Hells Canyon Res. | Oxbow Hatchery outlet |
| 5/4-21 | 39 | Hells Canyon Res. | Oxbow Hatchery outlet |
| | | | |

Signs and behavior strongly suggested a viral disease episode and samples were sent to the Eagle Fish Health Laboratory for analysis. To avoid possible contamination, approximately 225,700 fry were destroyed. Subsequent results from Eagle were negative for **virus**, but speculated that the loss was due to delayed stress from the water shut-off.

All unsalvaged steelhead carcasses (adult and fry) were disposed of in the Halfway sanitary landfill by the LaRue Sanitary Service. The salvaged adult carcasses from the truck episode (124 total) were picked up by a representative of the Nez Perce Indian Tribe. Another 32 carcasses salvaged from the whirling disease samples were donated to the Oregon Department of Human Resources, Adult and Family Services Division.

Spring Chinook Salmon Trapping

The Hells Canyon fish trap was put in operation on May 4 and ran continuously until June 21. It was down for 21 hours, then put back into operation until June 25. The trap operated for a total of 1,202 hours and captured 547 spring chinook salmon (543 adults and 4 jacks).

All salmon were trucked to Oxbow Hatchery, where they were anesthetized, length measured, injected with erythromycin phosphate, and checked for tags, brands, clips, and other marks or wounds. Length frequency distributions for all fish are shown in Figure 4. There were 12 (2.2%) adipose-clipped adults, but no adipose-clipped jacks. Two clipped adults also carried NMFS jaw tags. Twelve fish (2.2%) had gill net scars, two fish (0.4%) had nitrogen gas emboli, and 142 fish (26.0%) had other scars or wounds of uncertain origin.

Incidental fish species captured with the salmon included 39 adult steelhead, 45 rainbow trout/residualized steelhead smolts, 5 whitefish, and an unrecorded number of carp, suckers, squawfish, and chiselmouth chub. The steelhead, trout, and whitefish were all released into Hells Canyon Reservoir, and the rough fishes were destroyed.

Spring Chinook Transport

The IPC truck and drivers made five trips to the Rapid River Hatchery in May and six trips in June to transport a total of 536 chinook salmon (532 adults and 4 jacks). Only one fish was lost in transit. Water temperatures on the truck were reduced by adding block ice. The first seven loads (34-84 fish/load) each received 750 lbs. of ice and temperatures were reduced from $58-61^{\circ}F$ to $45-47^{\circ}F$. The last four loads (5-18 fish/load) received 450-600 lbs. of ice and the water temperatures were reduced from $61-65^{\circ}F$ to $54-56^{\circ}F$. New insulation around the truck tank kept water temperatures from rising more than 1-2 degrees during the hauls, even with air temperatures in the 90s.

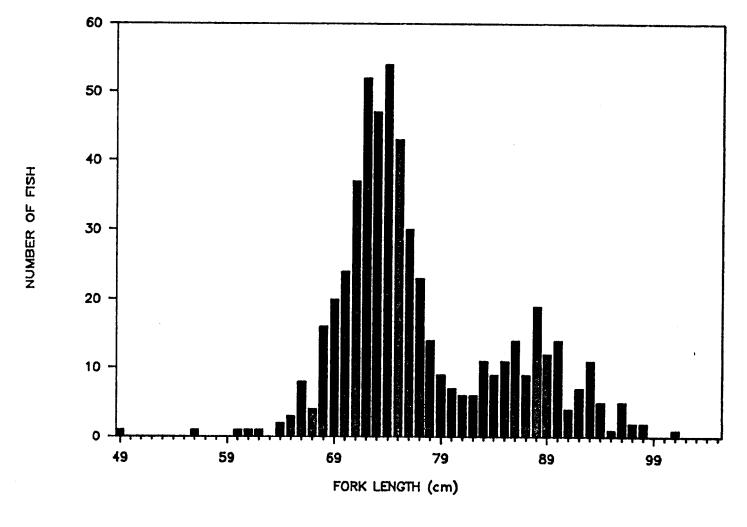


Figure 4. Length frequency distribution of spring chinook salmon, Oxbow, 1987.

Spring Chinook Health and Mortality

Total mortality of spring chinook between the Hells Canyon trap and Oxbow Hatchery was 11 fish (2.0%). Four were trap mortalities, and seven died after delivery to the hatchery. Four carcasses were salvaged, frozen, and taken to Rapid River Hatchery for _later distribution. Unsalvagable carcasses were disposed of in the Halfway sanitary landfill.

All live fish brought to the hatchery received subcutaneous injections of erythromycin phosphate to inhibit Renibacterium salmoninarum. Fish under 76 cm fork length received 50 mg erythromycin, and those over 76 cm received 100 mg.

Further information regarding holding and spawning of these fish can be found in the Rapid River Hatchery 1987 Brood Year Report (Levendofske, in press).

EXPERIMENTAL PROJECTS

Induced Maturation of Steelhead

There are two periods where unripe steelhead may present problems during spawning at Oxbow. It is sometimes difficult to find enough fully ripe males during the first spawns in March. And there are always a few late females that are not yet ripe by the middle of May. Leutenizing hormone-releasing hormone analogue [LH-RH(a)] was tested to determine if it would alleviate these problems.

Three males were given intraperitoneal injections of LH-RH(a) at 90 micrograms/lb. body weight on March 17. All produced fair quantities of sperm (subjectively measured) in six days, but not appreciably more than noninjected males. A large portion of the uninjected males were ripe early this season, so a comparison of quantity of sperm produced was inconclusive. Two injected males were used to fertilize the eggs of two separate females, one on March 23 and the other on April 7. Eye-up of the eggs in the earlier group was 92.9% (compared to 77.2% for all other eggs taken that day), and 67.9% for the later group (compared to 72.8% for others taken on that day), indicating that sperm from the first male was definitely viable one week after injection and the sperm of the other male was not appreciably less viable than that of noninjected males three weeks after injection.

A group of 10 females were given intraperitoneal injections of LH-RH(a) on April 24. Two control fish were injected with similar quantities of saline solution. All were "wild" or natural production fish that were still green after most hatchery-origin females had been spawned. Two injected fish and one control were ripe four days later. Two more injected females were ripe six days postinjection, and three more were ripe on Day 12. One injected fish died and two, plus the other control, were still green on Day 17 (May 11) when the experiment was terminated.

Eggs taken from the first two ripe females were accidentally destroyed when the bucket of eggs was spilled. Eggs from the other females had very low eye-up survival (18-20X) but were only slightly worse than the other eggs taken on the same days (21-222). Other factors, like high water temperature and related fungus problems and increased handling of green eggs, may have contributed to the poor eye-up of all these late eggs. This information indicates that LH-RH(a) may have some affect in inducing maturation of green female steelhead, but is inconclusive on whether or not the treatment produces viable eggs.

Argentyne Water Hardening

Two tests were run to determine the lethal concentration of Argentyne when used to water harden freshly fertilized steelhead eggs at Oxbow Hatchery. The first test was done using only Argentyne and river water, the second with the addition of one teaspoon of baking soda (sodium bicarbonate) to each five liters of Argentyne solution. The mortality rates to eye-up are shown in Table 3. No statistical analysis has been attempted, as other uncontrolled factors were involved. It is obvious that there is a strong correlation between active iodine concentration and mortality of eggs. Eggs in the second buffered test were observed to have fewer blanks immediately after water hardening. This suggests that the addition of baking soda may have reduced the immediate lethal effect of high iodine concentrations. But the poorer eye-up percentages, which may have been a result of other factors, do not support this. Both tests were conducted late in the spawning season when general eye-up was poor, but the second was done on the last spawning day when general eye-up was the Similar tests should be repeated another year using earlier, worst. better-quality eggs to achieve more meaningful results.

Smallmouth Bass Spawning and Rearing

An experiment to achieve controlled spawning of smallmouth bass (Micropterus dolomieui) and start early rearing of larvae on an artificial diet was carried out in the summer of 1987, similar to that reported by Schriever (1985). Wild brood fish were collected by electrofishing and by hook and line from Brownlee and Hells Canyon reservoirs. Spawning boxes were placed in a concrete raceway. The major change made in this study was that a microencapsulated larval diet, Rangens AP-100, was used to start larvae instead of the salmon starter used by Schriever. Spawning success was poor, as only four nests of eggs were laid and only one successfully recovered. Approximately 300 larval bass were collected and placed in an 8-ft. fiberglass vat with an injector feeding system. Larvae began to swim-up into the water column seven days after hatch and artificial feed of 150-200 micron diameter was first presented on Day 9. The larval bass were visually observed feeding immediately after food was first presented. Feed diameter was increased to 200-300 microns on Day 13 and again to 300-500 microns on Day 30. An excess of feed was presented each day.

Table 3. Results of tests using increasing concentrations of Argentyne in water-hardening solutions for steelhead trout eggs at Oxbow Hatchery, spring, 1987.

Percent mortality at eye-up Test 2^b Test la Concentration (ppm) 76.7 43.3 0 89.2 50 74.6 100 69.5 96.0 69.8 200 93.0 300 68.3 93.6 400 97.2 86.1 500 100.0 98.4 600 100.0

^aApril 24; no buffering agent.

^bMay 6; baking soda added to neutralize acidity.

Other responsibilities required that the intensive portion of the test be terminated at the end of August. Survival to August 31 (Day 58) was 232 fry (approximately 77X). The fry then averaged 25.14 mm in length and weighed an average of 0.218 g each. The fry were subsequently kept and fed a mixture of Rangens AP-100 and Rangens No. 1 trout feed, presented three times per day from an automatic pan feeder. The remainder, 176 fish (58.7% survival), were released from the hatchery on November 13. Average length upon release was 33.37 mm and average weight was 0.536 g. Growth patterns for length and weight and survival rate are presented in Figures 5, 6, and 7.

Results indicated it is best to allow bass eggs to hatch and then collect the larvae from the spawning boxes, rather than to attempt to collect eggs before hatch. Also, improved survival of swim-up fry can be achieved using an injector feed system to present Rangens AP-100 diet.

HATCHERY IMPROVEMENTS

The adult ponds were drained and thoroughly cleaned following salmon trapping. The loading hopper tower was cleaned, primed, and painted to match the crowders and other hatchery trim. This was a major improvement in the appearance of the hatchery. A new work deck was also installed on top of the tower around the loader drive motors. New handrails were installed on the walkway out to the pump stand. A second control switch for the center alley crowder was installed on the east end of the alley above the sorting/spawning pit. A new domestic water line was run to the residence trailer. Two 8-ft. fiberglass vats were acquired from Niagara Springs Hatchery, and five 16-ft. vats were acquired from the Mackay Hatchery.

Plywood panels and carpet padding were installed around the holding pool of the Hells Canyon fish trap. These were very successful in keeping adult fish from jumping out of the trap and dying on the deck, but are only a temporary solution to basic design problems in the trap.

RECOMMENDATIONS FOR FUTURE IMPROVEMENTS

- 1. The 100-horsepower pump on the Pine Creek substation line should be pulled for repairs and the check valves on the water lines repaired or replaced.
- 2. A concrete retainer wall should be poured around the east side of the truck ramp and unloading pool.
- 3. Rock baskets should be placed around the north corner of the hatchery fence to prevent erosion from undercutting the corner posts.

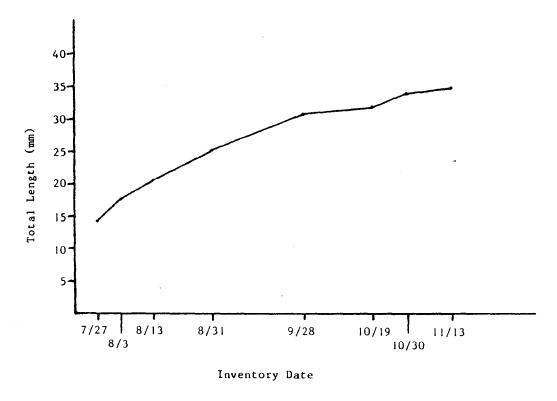


Figure 5. Average total length of smallmouth bass reared at Oxbow Hatchery, July-November, 1987.

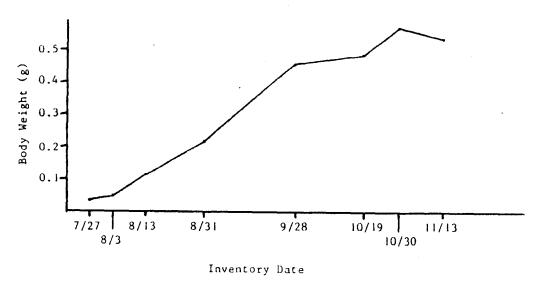


Figure 6. Average body weight of smallmouth bass reared at Oxbow Hatchery, July-November, 1987.

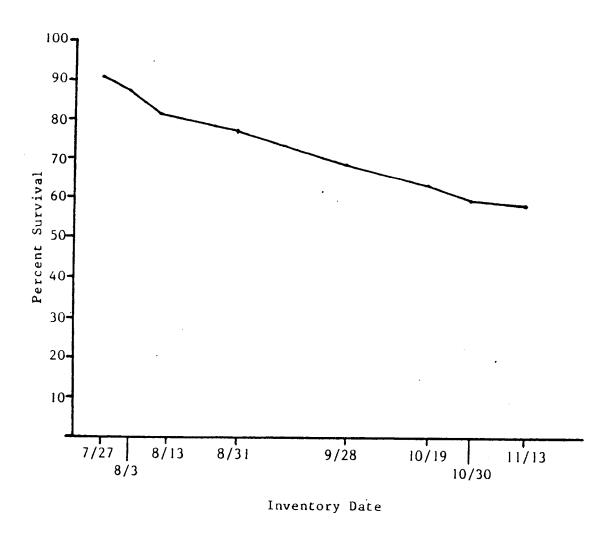


Figure 7. Survival rate of smallmouth bass fry reared at Oxbow Hatchery, July-November, 1987. (Assumes an initial hatch of 300 fry.)

- 4. The raceways need new bottoms and keyways.
- 5. The inside walls of the incubator room are water damaged. Some portions need to be replaced and all need to be repainted.
- 6. Major alterations are needed in the Hells canyon trap to remove sharp objects and steel cables, which cause numerous injuries to jumping fish.

MISCELLANEOUS ACTIVITIES

An estimated 800 people visited the hatchery during the period covered by this report, including school tours from Halfway and Boise. The facility is slowly becoming better known as steelhead and salmon runs improve.

Hatchery personnel participated in various other Department and outside activities, including local enforcement patrols with Conservation Officer, Don Stucker, and Oregon State Patrol Game Officer, Bill Berry; flying spring deer counts with Biologist, Mike Schlegel; helping spawn chinook salmon at Rapid River Hatchery; and assisting with a Hunter Education class at Oxbow.

ACKNOWLEDGEMENTS

Thanks go to Larry Wimer and the IPC crew, whose assistance is instrumental in the operation of Oxbow Hatchery. Special appreciation goes to Jason Harriman and Ray Zaccone, the IPC truck drivers who transported the fish from the trap and to Rapid River. Thanks also go to Bill Hutchinson, Joe Chapman, and Rick Lowell, who all helped out during the steelhead spawning season.

Gene Merritt of Halfway, Oregon, put in another fine season as the only Bio-Aide on the station. His skills and effort are greatly appreciated.

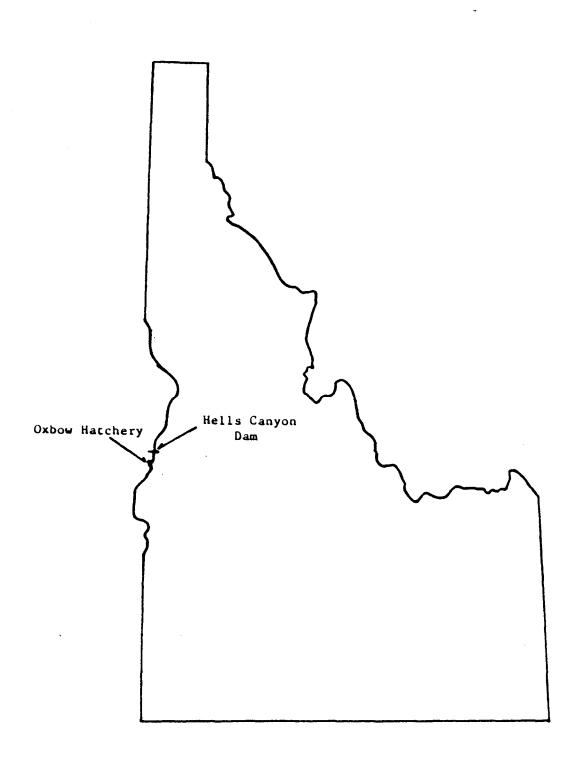
LITERATURE CITED

Schriever, E.B. 1985. Smallmouth bass culture at Oxbow Hatchery: feed training swim-up fry. Idaho Department of Fish and Game. Boise.

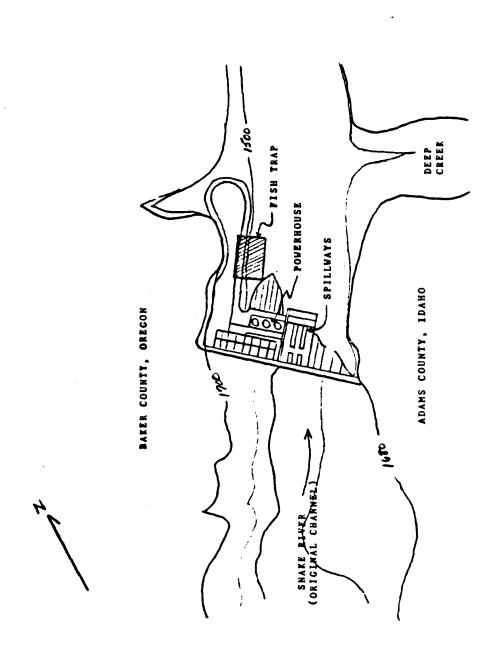
APPENDICES

20

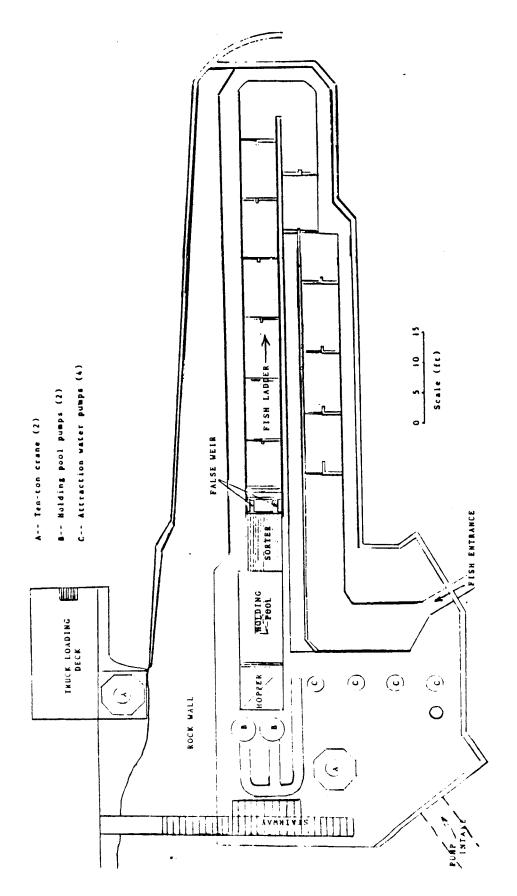
Appendix 1. Location of Oxbow Hatchery and the Hells Canyon Dam complex.



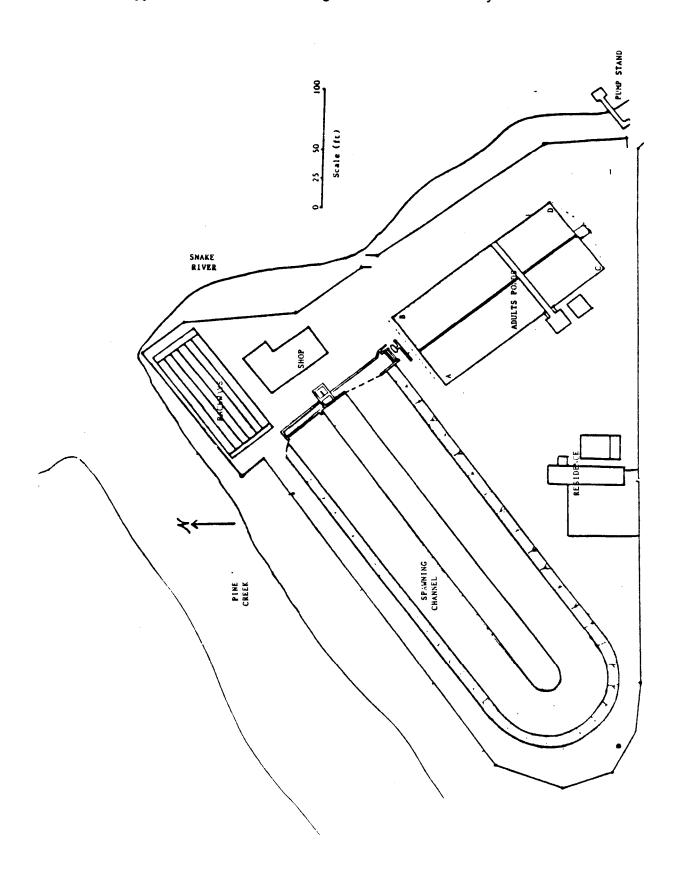
Appendix 2. Relative location of the Hells Canyon fish trap to the Hells Canyon Dam complex.



Appendix 3. Schematic diagram of the Hells Canyon fish trap.



Appendix 4. Schematic diagram of Oxbow Hatchery.



Appendix 5. Historical record of steelhead trapping and spawning at Oxbow Hatchery.

| | | Fish | | | | | |
|----------|-------|-----------|-------|---------|------------|-----------|---------|
| | Fish | | | | | | |
| | | d trapped | | Number | | | Percent |
| | in | in | | females | | | |
| Year | fall | spring | Total | spawned | Green eggs | Eyed eggs | eye-up |
| 1963-64a | 413 | 0 | 413 | 0 | | | |
| 1964-65ª | 495 | 0 | 495 | 0 | | | |
| 1965-66 | 3,722 | 797 | 4,519 | 1,145 | 3,642,640 | 3,085,194 | 84.7 |
| 1966-67 | 4,108 | 846 | 4,954 | 2,547 | 8,181,420 | 8,102,840 | 99.0 |
| 1967-68 | 1,026 | 583 | 1,609 | 801 | 2,553,990 | 2,469,536 | 96.7 |
| 1968-69 | 1,122 | 344 | 1,466 | 701 | 2,946,130 | 2,495,335 | 84.7 |
| 1969-70 | 129 | 312 | 441 | 272 | 1,526,054 | 1,320,494 | 86.5 |
| 1970-71 | 279 | 5 | 284 | 175 | 773,224 | 663,201 | 90.0b |
| 1971-72 | 700 | 0 | 700 | 412 | 1,949,662 | 1,819,721 | 93.3 |
| 1972-73 | 270 | 165 | 435 | 321 | 1,399,168 | 1,261,384 | 90.2 |
| 1973-74 | 125 | 1 | 126 | 73 | 309,950 | 262,698 | 89.8c |
| 1974-75 | 34 | 0 | 34 | 9 | 54,169 | 51,559 | 95.2 |
| 1975-76 | 224 | 34 | 258 | 182 | 772,468 | 731,442 | 94.7 |
| 1976-77 | 183 | 18 | 201 | 143 | 591,420 | 564,466 | 95.4 |
| 1977-78 | 134 | 52 | 186 | 102 | 452,257 | 441,069 | 97.5 |
| 1978-79 | 9 | 27 | 36 | 22 | 134,122 | 124,814 | 93.1 |
| 1979-80 | 200 | 139 | 339 | 136 | 608,308 | 596,696 | 98.1 |
| 1980-81 | 124 | 34 | 158 | 69 | 365,838 | 310,978 | 85.0 |
| 1981-82 | 203 | 2 | 205 | 68 | 294,226 | 259,771 | 88.3 |
| 1982-83 | 872 | 0 | 872 | 444 | 2,281,292 | 1,616,295 | 70.9 |
| 1983-84 | 1,082 | 34 | 1,116 | 279 | 1,313,668 | 996,460 | 75.8 |
| 1984-85 | 947 | 396 | 1,343 | 700 | 2,977,355 | 2,458,870 | 82.7 |
| 1985-86 | 2,438 | 0 | 2,438 | 332 | 1,315,999 | 1,032,233 | 78.4 |
| 1986-87 | 2,455 | 754 | 3,209 | 618 | 2,851,086 | 2,074,900 | 72.3 |
| | | | | | | | |

^aIncidental catch during fall chinook trapping.

R9FS067T2 25

 $^{^{\}mathrm{b}}36,960$ green eggs shipped to Niagara Springs Hatchery.

c17,400 green eggs shipped to Niagara Springs Hatchery.

Appendix 6. Historical record of spring chinook salmon trapped in the Hells Canyon fish trap.

| Release | No. smolts released | Returns | s (by age cla | ass) ^a | | Percent |
|--|--|---|---|---|-------------------|----------------------|
| year | | 3 yr. olds | 4 yr. olds | 5 yr. olds | Total | return |
| 1981 1982 1983 1984 1985 1986 | 1,001,700 0 250,050 500,850 437,860 140,000 444,700 ^d | $\begin{array}{c} \mathrm{ND} \\ \mathrm{ND} \\ \mathrm{ND} \\ \mathrm{61^b} \\ \mathrm{14} \\ \mathrm{4} \\ \mathrm{11^c} \end{array}$ | ND ND 454 ^b 317 387 41° | ND 209 ^b 62 156 407 ^c | 516 534 808 | 0.21 0.11 0.18 |

^aAge determinations made by individual fork lengths:

 $^{3 \}text{ yrs. old} = <61 \text{ cm},$

 $^{4 \}text{ yrs. old} = 62-79 \text{ cm, and}$

⁵ yrs. old = >80 cm.

b36 fish trapped but not measured in 1985.

 $^{^{\}circ}$ Counts as of 6/29/88.

^dSmolts from Pahsimeroi Hatchery.

Appendix 7. Length frequency of female steelhead, Oxbow, 1986-1987.

| ength | Numbe |
|----------|----------|
| 50 | 1 |
| 51 | 1 |
| 52 | 3 |
| 53 | 3 |
| 54 | 7 |
| 55 | 14 |
| 56 | 27 |
| 57 | 37 |
| 58 | 46 |
| 59 | 52 |
| 60 | 75 |
| 61 | 52 |
| 62 | 49 |
| 63 | 27 |
| 64 | 19 |
| 65 | 15 |
| 66 | 9 |
| 67 | 14 |
| 68 | 26 |
| 69 | 34 |
| 70 | 35 |
| 71 | 61 |
| 72 | 55 |
| 73 | 74 |
| 74 | 64 |
| 75 76 | 57 41 |
| 76 | 36 |
| 78 | 16 |
| 78 79 | 24 |
| 80 | 6 |
| 81 | 4 |
| 82 | 3 |
| 83 | 0 |
| 84 | 0 |
| 85 | 3 |
| 86 | 0 |
| 87 | 0 |
| 88 | 0 |
| 89 | 1 |

R9FS067T1 27

Appendix 8. Length frequency of male steelhead, Oxbow, 1986-1987.

| ngth | Num |
|------|------------|
| 50 | 1 |
| 51 | 3 |
| 52 | 3 |
| 53 | 8 |
| 54 | 2 |
| 55 | 9 |
| 56 | 14 |
| 57 | 29 |
| 58 | 34 |
| 59 | 47 |
| 60 | 73 |
| 61 | 68 |
| 62 | 71 |
| 63 | 67 |
| 64 | 49 |
| 65 | 39 |
| 66 | 30 |
| 67 | 16 |
| 68 | 11 |
| 69 | 14 |
| 70 | 10 |
| 71 | 6 |
| 72 | 10 |
| 73 | 19 |
| 74 | 21 |
| 75 | 30 |
| 76 | 27 |
| 77 | 27 |
| 78 | 32 |
| 79 | 29 |
| 80 | 22 |
| 81 | 11 |
| 82 | 19 |
| 83 | 11 |
| 84 | 5 |
| 85 | ϵ |
| 86 | 2 |
| 87 | 1 |
| 88 | C |
| 89 | C |
| 90 | 2 |
| 91 | C |
| 97 | 1 |

Appendix 9. Length frequency of adult chinook, Oxbow, 1987.

| Fork lengths (cm) | Number of fish |
|-------------------|-------------------|
| 49 | 1 |
| 56 | 1 |
| 60 | 1 |
| 61 | 1 |
| 62 | 1 |
| 63 | 0 |
| 64 | 2 |
| 65 | 3 |
| 66 | 8 |
| 67 | 4 |
| 68 | 16 |
| 69 | 20 |
| 70 | 24 |
| 71 | 37 |
| 72 | 52 |
| 73 | 47 |
| 74 | 54 |
| 75 | 43 |
| 76 | 30 |
| 77 | 23 |
| 78 | 14 |
| 79 | 9 |
| 80 | 7 |
| 81 | 6 |
| 82 | 6 |
| 83 | 11 |
| 84 | 9 |
| 85 | 11 |
| 86 | 14 |
| 87 | 9 |
| 88 | 19 |
| 89 | 12 |
| 90 | 14 |
| 91 | 4 |
| 92 | 7 |
| 93 | 11 |
| 94 | 5 |
| 95 | 1 |
| 96 | 5 |
| 97 | 2 |
| 98 | 2 |
| 99 | 0 |
| 100 101 | 0 1 |

Submitted by:

Douglas R. Burton Hatchery Superintendent I

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

Steven M. Huffaker, Chief Bureau of Fisheries

- Van

Anadromous Hatcheries Supervisor